



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.

Tel: +254(0) 799 529 958, +254(0) 799 529 959, +254 (0)712 524 293

Website: www.must.ac.ke Email: info@mucst.ac.ke

UNIVERSITY EXAMINATIONS 2024/2025

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
OF TECHNOLOGY IN ELECTRICAL AND ELECTRONIC ENGINEERING

EET 3431: COMPUTER VISION

DATE: JANUARY 2025

TIME: 2 HOURS

INSTRUCTIONS: Answer Question ONE and any other TWO questions.

QUESTION ONE (30 MARKS)

- a) Define the following terms:
 - i) Computer vision
 - ii) Optical flow (2 Marks)
- b) State and explain any three applications of computer vision in today's world. (6 Marks)
- c) Describe the algorithm for blending digital images in computer vision systems. (2 Marks)
- d) An array sensor whose photodiodes can yield a minimum output voltage of 1.25 V and a maximum output voltage of 5 V was used to take an image of a scene and one of its photodiodes gave an output of 3.5 V. Quantize this output to yield an 8-bit pixel value and obtain its image negative. (6 Marks)
- e) Explain how a Laplacian operator can be used as a high pass filter for sharpening images. (4 Marks)
- f) Explain how an image can be segmented into two distinct regions using Otsu's thresholding method. (7 Marks)



MUST is ISO 9001:2015 and



ISO/IEC 27001:2013 CERTIFIED

- g) Briefly, discuss the classical method of detecting and classifying objects in images. (3 Marks)

QUESTION TWO (15 MARKS)

- a) Other than visible light, state any two sources of images. (2 Marks)
- b) Explain the two main components of a computer vision system. (2 Marks)
- c) Explain any three methods that are used to acquire RGB colour images. (6 Marks)
- d) Explain the difference between spatial and intensity resolution. (2 Marks)
- e) The array below shows pixels of a 3 x 3 image. Zoom it to a 6 x 6 image using the nearest neighbour interpolation algorithm. (3 Marks)

171 174 178
180 173 179
177 178 178

QUESTION THREE (15 MARKS)

- a) Define and state one application of histogram equalization. (2 Marks)
- b) Table Q3 shows the intensity distribution of a (100 x 100) 3-bit image. Equalize its histogram. (8 Marks)
- c) Obtain a (3 x 3) 2-D discrete Gaussian low pass filter by sampling the 2-D Gaussian function having a mean of 0 and a standard deviation of 1.5 in both dimensions. (5 Marks).

Intensity Value, r_k	No. of pixels per intensity value, n_k
r_0	1023
r_1	3220
r_2	567
r_3	600
r_4	937
r_5	1700
r_6	738
r_7	1215

Table Q3



QUESTION FOUR (15 MARKS)

- a) Explain the difference between image processing and computer vision. (2 Marks)
- b) Define pose estimation and explain how it works. (2 Marks)
- c) Explain any three applications of optical character recognition. (6 Marks)
- d) Explain how the Canny edge detector works. (5 Marks)

QUESTION FIVE (15 MARKS)

- a) Explain why Convolutional Neural Networks (CNN) are a popular choice for image classification in modern computer vision systems. State any two of their limitations. (4 Marks)
- b) Explain the different layers of a Convolutional Neural Network (CNN) that is used for image classification. (6 Marks)
- c) An input image has been converted into a matrix of size 12 x 12 along with a filter of size 3 x 3 with a Stride of 1. Determine the size of the convoluted matrix. (2 Marks)
- d) Explain any three common types of pooling used in Convolutional Neural Networks (CNN). (3 Marks)



MUST is ISO 9001:2015 and



ISO/IEC 27001:2013 CERTIFIED